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To: J. A. Lieberman
From: Harold Bernard, Sanitary Engineer
Isaac Van der Hoven, Meteorologist
Subject: TRIP REPORT TO NUCLEAR SCIENCE AND ENGINEERING CORPORATION, PITTSBURGH, PENNSYLVANIA, NOVEMBER 12, 1963 (DRAFT)

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This memorandum discusses the trip to Nuclear Science and Engineering Corporation, Pittsburgh, Pennsylvania. The purpose of the trip was to review current progress in the development and demonstration of an atmospheric tracer method (I-129) and to initiate plans for a field demonstration at National Reactor Testing Station in the summer of 1964.

6. Name and telephone number of person completing form:	7. Organization:	8. Date:
Don C. Bradley (208) 525-0203	Lockheed Idaho Technologies Co.	June 9, 1995

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HUMAN RADIATION EXPERIMENTS

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cc: Chief, EMRP, USWB
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DRAFT 11/15/63
IVanderHoven/HBernard:mas

To : J. A. Lieberman
THRU: W. G. Belter

From: Harold Bernard, Sanitary Engineer
Isaac Van der Hoven, Meteorologist

Subj: TRIP REPORT TO NUCLEAR SCIENCE AND ENGINEERING CORPORATION, PITTSBURGH, PENNSYLVANIA, NOVEMBER 12, 1963

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The purpose of the trip was to review current progress in the development and demonstration of an atmospheric tracer method and to initiate plans for a field demonstration at NRTS in the summer of 1964. Detailed program discussions were held with Drs. Robert C. Koch and Bernard Keisch, and contractual discussions with Dr. Raymond R. Edwards, all of NSEC.

Dr. Keisch began the discussions with a description of the procedure involved in developing a particulate and a gaseous atmospheric tracer. The steps involved are: (1) choice of carrier compound, (2) synthesis, (3) dissemination, (4) collection, and (5) analysis of the tracer. It would appear from results so far that the collection procedure of the gaseous tracer is the most difficult problem to overcome.

The choice of the aerosol carrier compound is diiodo-fluorescein which is organic in form and soluable in alcohol. I-125 is utilized in the synthesization and characterizations of the aerosol because of lower cost of analysis. Some difficulty has been encountered in synthesis of the I-125-labelled compound due to impurities in the

commercially available reagents but resolution of this problem is anticipated soon. The alcohol solution is disseminated by an atomizer-type nozzle similar to that used in NRTS by the USWB. A demonstration was performed out-of-doors with an available but undersized air compressor allowing dissemination for only a period of minutes which, for the purpose it was used was adequate. The mean mass particle size distribution of the spray is about 1 micron with a range of ~ .6 μ to 3 μ. Collection of the particles is on millipore-type glass fiber filters. The analysis is accomplished by dissolving the trapped particles in alcohol. The alcohol will not dissolve inorganic meterials and thus, if any I-129 (the eventual label for the tracer) occurs naturally in the atmosphere in inorganic form, a discrimination can be made between the organic tracer and inorganic background. The fluorescein offers a second analysis possibility, i.e., by use of fluorescent techniques, although its sensitivity is not nearly as large as an I-129 label. Its choice would be for close-in analysis which would be less expensive than using the I-129 tracer technique.

The choice of the gaseous carrier compound is trifluoro-methoyl iodide (CF_3I) which has a -22°C freezing point and is gaseous at atmospheric conditions. The synthesis of the labeled carrier is by a gas-phase exchange reaction $CF_3I + I^{129} \rightleftharpoons CF_3I^{129} + I_2$ at elevated pressure and temperatures. Since the carrier is a gas, the dissemination should offer no problem, though the collection of the gas appears to be troublesome, as expected. A charcoal bed

treated with trimethylamine producing the following solid phase reaction $(CH_3)_3 N + CF_3I \rightarrow N(CH_3)\ I^+CF_3^-$ requires too long a reaction time for practical application to a porous bed collection technique. Another reaction is being attempted using mercuric fluoride ($HgF_2 + 2\ CF_3I \rightarrow HgI_2 + 2\ CF_4$) and other theoretically promising coatings.

Dr. Koch, in discussing the sensitivity of I-129 indicated that 1 count/min = 6×10^{-13} grams of I-129 which includes a background count of 0.03 counts/min is 'easily attainable' in the field. Following development of a collection system it is proposed to test reactions of the CF_3I with various simulated atmospheric contaminants such as dust, SO_2, ozone, etc.

Following the presentation of current progress, it was decided to start formulating plans for a full-scale field study, presumably to be conducted at NRTS. A meeting was arranged between Koch, Keisch, Bernard, Van der Hoven, and Islitzer of Idaho and (possibly) Health and D Safety Division of IDO-AEC on November 19, 1963 at AEC, HQ. Discussions will involve the establishment of the goals we wish to attain in the field tests along with some sort of priority listing of these goals. Decisions on number and spacing of samplers, amount of meteorological documentation and the logistics of manpower and equipment needs are also on the agenda.

Discussions with Dr. Edwards following the end of the technical meeting mentioned the need for AEC to be kept informed but not necessarily by relatively voluminous progress reports - just the facts on as frequent a basis as required by the progress made.

Development of the plans for the field test should provide a basis for a renewal proposal to AEC of the present contract which ends January 15, 1964. MSEC anticipated that a proposal will be presented to AEC early in December.